

WE CLAIM:

1. A method of treating a food product to reduce microbial burden, comprising:  
contacting the food product with an antimicrobial agent, the antimicrobial agent  
5 comprising peroxycarboxylic acid, fatty acid, halogen containing antimicrobial agent,  
quaternary ammonium antimicrobial agent, peroxide, condensed phosphate, or mixtures  
thereof; and  
irradiating the food product.
- 10 2. The method of claim 1, further comprising packaging the food product before  
irradiation.
3. The method of claim 1, further comprising washing a food contact surface  
with an antimicrobial agent.
- 15 4. The method of claim 1, wherein the food product comprises red meat,  
seafood, poultry, ready to eat food, fruit, vegetable, seed, sprout, or a combination thereof.
5. The method of claim 1, wherein irradiating comprises irradiation with a  
20 quantity of radiation insufficient to acceptably reduce the microbial burden in the absence of  
contacting with an antimicrobial agent.
6. The method of claim 1, wherein contacting comprises contacting with a  
quantity of antimicrobial agent insufficient to acceptably reduce the microbial burden in the  
25 absence of irradiating.
7. The method of claim 1, wherein contacting and irradiating produce synergistic  
reduction in microbial burden on the food product.
- 30 8. The method of claim 1, wherein the antimicrobial agent comprises a  
peroxycarboxylic acid.

9. The method of claim 8, wherein the peroxycarboxylic acid comprises peroxyacetic acid.

5 10. The method of claim 9, wherein the peroxycarboxylic acid further comprises peroxyoctanoic acid.

10 11. The method of claim 8, wherein the antimicrobial agent comprises a densified fluid peroxycarboxylic acid composition.

12. The method of claim 11, wherein the peroxycarboxylic acid comprises peroxyacetic acid.

15 13. The method of claim 12, wherein the peroxycarboxylic acid further comprises peroxyoctanoic acid.

14. The method of claim 1, wherein irradiating comprises exposing the food product to gamma-radiation, X-rays, electron beam, or a combination thereof.

20 15. The method of claim 14, wherein exposing the food product to gamma-radiation employs gamma-radiation produced by cobalt-60 or cesium-137.

25 16. The method of claim 14, wherein exposing the food product to X-rays comprises electron beam bombardment of tungsten or tantalum.

17. The method of claim 14, wherein exposing the food product to electron beam comprises single or double sided electron beam irradiation.

30 18. An system for reducing microbial burden on a food product, the system comprising:

an applicator adapted and configured to contact a food product with an antimicrobial agent; and

an irradiator adapted and configured to irradiate a food product.

5           19.    The system of claim 18, wherein the applicator comprises a sprayer, an immersion bath or flume, or a foam applicator.

          20.    The system of claim 18, wherein the applicator further comprises an agitator adapted and configured to agitate a liquid antimicrobial composition.

10

          21.    The system of claim 18, wherein the applicator further comprises a heater adapted and configured to heat a liquid antimicrobial composition.

          22.    The system of claim 18, wherein the irradiator comprises a gamma-radiation  
15 irradiator, an X-ray irradiator, an electron beam irradiator, or a combination thereof.

          23.    The system of claim 22, wherein the gamma-radiation irradiator comprises cobalt-60 or cesium-137.

20           24.    The system of claim 22, wherein the X-ray irradiator comprises an electron beam adapted and configured to bombard tungsten or tantalum.

          25.    The system of claim 22, wherein the electron beam irradiator comprises a single or double sided electron beam irradiator.

25